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Observations on *Dioxys productus productus* (Cresson) as a parasite of *Anthidium utahense* Swenk

(Hymenoptera : Megachilidae)

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Bees of the genus *Dioxys* are "parasites," or depredators of larval food, of several genera of megachilid bees, including *Anthidium*, *Megachile*, and *Osmia* (Hurd, 1958). The biology of the genus is not well known although *Dioxys* adults have been observed in the field and reared from nests of their hosts (Newberry, 1900; Hicks, 1929). In 1962, I observed *Dioxys* females visiting nests of *Anthidium utahense* Swenk at North Logan, Utah, and later obtained adults from the nests. The following observations are offered as an addition to our knowledge of the biology of these bees.

Female *Anthidium utahense* nest in the ground in holes and crevices, frequently using cavities made by other insects and animals. They readily accept artificial nest cavities which offer vertical holes at ground level. I used short lengths of 2- by 4-inch lumber drilled with holes 1 to 3 inches apart along one of the narrow sides and buried so that this side was even with the surface of the ground. Soda straws 6.5 and 7.5 mm in diameter and 70 to 75 mm long were inserted in the holes to facilitate removal of completed nests. Blocks of wood so prepared were

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placed in sandy areas close to *Phacelia* and *Melilotus* plants which the bees visited for nectar and pollen. Thistles (*Cirsium*) and sagebrush (*Artemisia*) were also available nearby as sources of down which *Anthidium* females use for nest material.

On 21 June while collecting completed nests, I noticed a female *A. utahense* with a load of down entering the easternmost hole in a nest block on a sandy ridge. Two days later I observed nesting activity at the block for about 2 hours in the early afternoon. A female bee, presumably the same one, was carrying pollen into the hole at the end of the wooden block. She spent about 10 to 27 minutes gathering a load of pollen. A second female, carrying loads of down, was working in two other holes in the same block a few inches away. To obtain a load of down, the female spent about 1½ to 8 minutes away from the nest. During one of these trips, a female *Dioxys* entered the nest briefly and flew away. About an hour later a female *Dioxys* entered the nest into which the first *Anthidium* was carrying pollen. She stayed in the nest 1 minute 35 seconds and was caught as she emerged. The three posterior segments of her abdomen were noticeably smeared with pollen. The following day at 11 a.m. I observed that this nest was completed, with fine gravel filling the straw to the top.

I collected the nests from this block, and others nearby, on 24 July 1962. When I examined them on 10 August, four nests contained cocoons lacking the nipple found on cocoons of *Anthidium* and some other related genera. Each of the four nests contained two completed cells and, in each case, the atypical cell was the bottom one. One of these atypical cells was extremely small, even for *A. utahense*, and another was misshapen. All the cells were cold-conditioned at 55° and 42° F for about 5 months and then incubated at 84° F for emergence. After 19 days at the last temperature, three *A. utahense* females emerged from the normal, upper cells of the parasitized nests. At the same time, I also found a male *Dioxys* which had apparently emerged earlier and was dead and dry. When adults did not emerge from the other three cells, I opened them. The small cell contained an undeterminable bee larva which apparently died in the process of pupation. The other two cells contained dead, fully developed, female *Dioxys*.

Completed nests of *A. utahense* contained 1 to 4 cells and averaged 2.1 cells per nest. The top cells or single cells produced a 4 : 1 preponderance of females. In the lower cells the ratio was reversed in favor of the males. Linear cell series in nests of most aculeates produce more males than females in the outermost cells, just the opposite of *A. utahense*.

In my collection of immature specimens of *Anthidium* I found two mature larvae which have been identified by Dr. Jerome G. Rozen, Jr., The American Museum of Natural History, as *Dioxys* sp. They were found in nests of *Anthidium* collected at Smithfield, Utah, in 1961 and 1962. These larvae, probably *Dioxys productus productus*, will be described by Dr. Rozen.

Additional observation of *Dioxys* are needed to determine the site of egg deposition and its relation to the position, in a cell series, of the parasitized cell. The pollen on the abdomen of the female *Dioxys* which I collected may indicate that the egg is laid deep in the pollen mass or in the down beneath it. The nature of the early instar larvae and their relationship with host eggs or larvae also need investigation.

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The Genus *Aspidaphium* Börner

(Homoptera : Aphididae)

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The genus *Aspidaphium* which occurs on mosses was originally described by Börner (1939) with *A. escherichi* as the type of the genus. *A. jeschkei* was described at the same time. Later, *A. cuspidati* was described by Stroyan (1955). Börner and Heinze (1957) and Heinze (1960) discussed the genus and presented a key to the species. Stroyan (1963) studied the material he had been able to collect during recent years as well as the Börner types and he concluded that *A. jeschkei* Börner was a synonym of *A. escherichi* Börner. This paper presents the description of a new species of *Aspidaphium* and a key to the known species.

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